

MATHEMATICS EDUCATION IN NATIONAL UNIVERSITY OF SINGAPORE

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1. Existing mathematics courses for Arts and Science students

Currently, the Department of Mathematics offers two subjects in Year 1 : Mathematics and General Mathematics. The first subject is offered to potential mathematicians. It consists of three main courses : Algebra, Analysis 1, Probability and Statistics. The second subject is offered to students who need knowledge in mathematics but do not wish to become mathematicians. The subject also consists of three courses ; Algebra, Calculus, Probability and Statistics. These two subjects differ slightly in content but mainly in approach. The first subject has emphasis on mathematical rigour and concepts while the second stresses on techniques and applications. In each subject students attend $5\frac{1}{2}$ hours of lectures per week plus 3 hours of tutorials. There are 25 teaching weeks per academic year. All students reading either Mathematics or General Mathematics have to offer two other subjects from other departments.

In Year 2, the Department of Mathematics also offers two subjects : Mathematics A and Mathematics B. Students who wish to specialise in mathematics have to read both subjects together with a third subject from another department. Those who do not wish to specialise in mathematics may offer only Mathematics A and two other subjects from other departments. Mathematics A consists of three courses : Vector Analysis and Numerical Analysis 1, Operations Research 1 and Statistic 1. Mathematics B consists of two courses : Analysis 1 and Analytical Dynamics 1 and 2. Each subject consists of 4 hours of lectures plus 2 hours of tutorials per week.

Students who offered both Mathematics A and Mathematics B in Year 2 may proceed to read Mathematics A and Mathematics B in Year 3. Students who only read Mathematics A in Year 2 are allowed to read only Mathematics A in Year 3. Mathematics A in Year 3 consists of the following courses : Numerical Analysis 2 and Operations Research 2, Differential Equations and Statistics 2. Mathematics B in Year 3 consists of Algebra, Analysis 2 (Real Analysis) and Analysis 3 (Complex Analysis). Each subject consists of 6 hours of lectures plus 3 hours of tutorials per week. Students reading both mathematics subjects do not need to take another subject but students offering only Mathematics A have to read another subject. Students passing the Year 3 Final Examinations are conferred a Bachelor Degree.

The Honours Mathematics course in Year 4 is offered only to students who have performed well in the Year 3 Mathematics A and Mathematics B examinations. In the academic year 1980/81, the following topics are offered : Algebra, Analysis, Probability Theory and Statistics, Topology, Operations Research and Control Theory, Classical Theory of Fields, and Automata Theory. A student has to offer six topics from the above seven. Each topic consists of 2 hours of lectures plus 1 hour of tutorial per week. On passing the Honours course examinations, students are conferred with Honours Degree and are classified according to their performance into First Class,

Second Class Upper, Second Class Lower and Third Class.

Students with good Honours degrees may proceed to do post-graduate studies leading to M.Sc and Ph.D.

2. Revised mathematics courses for Arts and Science students

In the academic year 1980/81, 597 students read mathematics in the first year, 497 in the second year and 210 in the third year. In view of the large numbers of students, there is an urgent need to revise the existing mathematics courses in order to cater for the varying interests of the students. This can be achieved by dividing the students into two groups, with one group who require mathematics as a service course useful to their main field of interest in other subjects, while the other group regard mathematics as their main area of specialization.

The need to stream the large number of students into separate groups was recognised in 1979/80, and as a result a new subject, General Mathematics, was introduced for first year students in 1980/81. With the introduction of General Mathematics, the existing mathematics courses in Year 2 and Year 3 have to be modified. The following proposal for the revised mathematics courses is the result of several meetings attended by all teaching members of the Department of Mathematics. It has the support of the whole Department.

The proposed revised mathematics courses may be summarised as follows :

1. In Year 1, students may read either General Mathematics or Mathematics, but not both subjects.
2. In Year 2 and Year 3, Mathematics A and Mathematics B are offered subject to the following conditions :
 - (i) Students who read General Mathematics in Year 1 may read Mathematics A but not Mathematics B.
 - (ii) Students who read Mathematics in Year 1 may read Mathematics A or Mathematics A and Mathematics B.
 - (iii) Students who read Mathematics A and Mathematics B in Year 2 and who wish to offer only one mathematics subject in Year 3 have to read Mathematics A.
 - (iv) Students who intend to offer Mathematics in the Honours year must read Mathematics in Year 1 and both Mathematics A and Mathematics B in Year 2 and Year 3.

Courses in Mathematics A are divided into two groups. Courses in Group 1 are designed for students who read only one mathematics subject while courses in Group 2 are designed for students who read two mathematics subject.

The proposed revised mathematics courses, apart from incorporating the existing courses, have also included new courses. The objectives are to stress the importance of the basic courses and to provide greater flexibility and more options in order to cater for the various needs of students who will pursue different careers needing different aspects of mathematics. The fundamental difference between Mathematics A and

Mathematics B is that emphasis is placed more on methods and applications in the former, while the later stresses more on mathematical rigour, concepts and theory.

The first year courses have already been implemented this academic year (1980/81). If the proposed revised mathematics courses are approved, then the second year courses for Mathematics A and Mathematics B will be implemented in 1981/82 and the third year courses in 1982/3. The implementation of the proposed revised mathematics courses in stages should not pose any difficulty because there is no change in the degree structure nor any increase or decrease in the number of lectures, tutorials, etc. The only difference compared with the existing mathematics courses is the increase of optional courses.

The following shows the course structure for General Mathematics and Mathematics (Year 1), Mathematics A and Mathematics B (Years 2 and 3) and Honours Mathematics.

Year 1 General Mathematics

G 101 :	Algebra	(50 lectures + 25 tutorials)
G 102 :	Calculus	(50 lectures + 25 tutorials)
G 103 :	Probability and Statistics	(40 lectures + 12 tutorials)

Examination : 2 papers (3 hours per paper)

Note : General Mathematics is designed for students who require mathematics as a service course useful to their main field of interest in other subjects.

Year 1 Mathematics

M 101 :	Algebra	(50 lectures + 25 tutorials)
M 102 :	Analysis I	(50 lectures + 25 tutorials)
M 103 :	Probability and Statistics	(40 lectures + 12 tutorials)

Examination : 2 papers (3 hours per paper)

Note : Mathematics is designed for students who regard mathematics as their main area of specialization.

Year 2 Mathematics A

Group 1	{	1st Semester	
		A 201 :	Advanced Calculus I (30 lectures + 15 tutorials)
	A 202 :	Applied Statistics I (30 lectures + 15 tutorials)	
	}	2nd Semester	
		Each student must offer two of the following :	
		A 203 :	Applied Algebra (20 lectures + 10 tutorials)
		A 204 :	Numerical Analysis I (20 lectures + 10 tutorials)
A 205 :		Techniques in Operational Research I (20 lectures + 10 tutorials)	

Examination : 2 papers (3 hours per paper)

Note : Mathematics A Group 1 is designed for students who took either General Mathematics or Mathematics in Year 1 and would like to take only one subject in mathematics in Year 2.

Group 2	}	1st and 2nd Semester	
		A 206 :	Probability (30 lectures + 15 tutorials)
		A 207 :	Mathematical Methods I (20 lectures + 10 tutorials)
		A 208 :	Elementary Dynamics (50 lectures + 25 tutorials)

Examination : 2 papers (3 hours per paper)

Note : Mathematics A Group 2 is designed for students who took Mathematics in Year 1 and would like to take two subjects in mathematics in Year 2. These students have to take Mathematics B as the second subject in mathematics in Year 2.

Year 2 Mathematics B

B 201 :	Linear Algebra	(30 lectures + 15 tutorials)
B 202 :	Analysis II	(50 lectures + 25 tutorials)
B 203 :	Geometry	(20 lectures + 10 tutorials)

Examination : 2 papers (3 hours per paper)

Note : Mathematics B is to be taken by students who would like to take two subjects in mathematics in Year 2.

Year 3 Mathematics A

Each student must offer three of the following:

Group 1	}	A 301 :	Combinatorial Analysis	(50 lectures + 25 tutorials)
		A 302 :	Advanced Calculus II	(50 lectures + 25 tutorials)
		A 303 :	Applied Statistics II	(50 lectures + 25 tutorials)
		A 304 :	Numerical Analysis II	(50 lectures + 25 tutorials)
		A 305 :	Techniques in Operational Research II	(50 lectures + 25 tutorials)

Examination : 3 papers (3 hours per paper)

(Not all courses will be offered by the Department in any one year)

Note : Mathematics A Group 1 is designed for students who either took one mathematics subject or two mathematics subjects in Year 2 and would like to take only one mathematics subject in Year 3.

Each student must offer three of the following:

Group 2	}	A 306 :	Combinatorial Analysis	(50 lectures + 25 tutorials)
		A 307 :	Optimization	(50 lectures + 25 tutorials)
		A 308 :	Mathematical Statistics	(50 lectures + 25 tutorials)
		A 309 :	Numerical Analysis	(50 lectures + 25 tutorials)
		A 310 :	Mathematical Methods II	(50 lectures + 25 tutorials)
		A 311 :	Theoretical Mechanics	(50 lectures + 25 tutorials)
		A 312 :	Continuum Mechanics	(50 lectures + 25 tutorials)
		A 313 :	Fluid Dynamics	(50 lectures + 25 tutorials)
		A 314 :	Electromagnetic Theory	(50 lectures + 25 tutorials)
		A 315 :	Operational Research	(50 lectures + 25 tutorials)

(Not all courses will be offered by the Department in any one year)

Note : Mathematics A Group 2 is designed for students who took two mathematics subjects in Year 2 and would like to continue to take two mathematics subjects in Year 3. The other mathematics subject has to be Mathematics B.

Year 3 *Mathematics B*

B 301 :	Modern Algebra	(50 lectures + 25 tutorials)
B 302 :	Topology and Real Analysis	(50 lectures + 25 tutorials)
B 303 :	Complex Analysis	(50 lectures + 25 tutorials)

Examination : 3 papers (3 hours per paper)

Note : Mathematics B is designed for students who took two mathematics subjects in Year 2 and would like to continue to take two mathematics subjects in Year 3. The other mathematics subject has to be Mathematics A Group 2

Year 4 *Honours Mathematics*

Each student must offer six of the following:

1. Algebra
2. Analysis
3. Probability Theory and Statistics
4. Topology
5. Operational Research and Optimization
6. Classical Theory of Fields
7. Automata Theory and Formal Languages
8. Mathematical Logic and Foundation of Mathematics
9. Theory of Relativity
10. Graph Theory and Theory of Numbers

(Not all courses will be offered by the Department in any one year).

Note : Honours Mathematics are only offered to students who have done well in both Mathematics A and Mathematics B in Year 3.

3. Mathematics courses for Engineering students

Besides the mathematics courses offered to Arts and Science students, the Department of Mathematics also conducts mathematics courses for Engineering students. Mathematics is a compulsory subject for Year 1 and Year 2 Engineering students. The courses for Year 1 are Algebra and Calculus and those for Year 2 are Algebra, Calculus and Statistics.

4. Requirements for reading mathematics courses

The minimum requirement for reading General Mathematics in the University is a pass in either Additional Mathematics in the G.C.E. 'O' Level (or equivalent) Examination or Pure Mathematics or Mathematics at least at ordinary level in the G.C.E. 'A' Level Examination.

The minimum requirement for reading Mathematics in the University is a pass at advanced level either in Mathematics (Syllabus A or B) or Pure Mathematics or Further Mathematics in the G.C.E. 'A' Level Examination or its equivalent.

Students seeking admission to the Faculty of Engineering must have passed at advanced level Mathematics or Pure Mathematics or Applied Mathematics in the G.C.E. 'A' Level Examination or its equivalent.

5. Teaching staff members and their fields of specializations

Currently, the Department of Mathematics has 33 full time teaching staff members and 3 senior tutors. Their fields of specializations and research include the following:

1. Functional Analysis and Integration Theory.
2. Group Theory, Ring Theory, Lattice Theory, Number Theory.
3. Probability Theory and Statistics.
4. Operations Research, Optimization Theory and Control Theory.
5. Applied Mathematics, Mathematical Physics and Theory of Differential Equations.
6. History of Chinese Mathematics and Mathematical Education.
7. Logic and Foundation of Mathematics.
8. Combinatorial Analysis and Graph Theory.
9. Algebraic Topology and Synthesis Geometry.
10. Automata Theory and Formal Languages.

6. Academic activities and research facilities

The Department organises regular seminars on various topics. An International Mathematical Conference will be organized jointly by the Singapore Mathematical Society and the Department of Mathematics from 1st to 13th June, 1981. The Conference will consist of two Workshops and a General Conference. The topics of the workshops are (a) Ring Theory and Homological Algebra and (b) Probability Theory.

The Department is also planning to organise a conference on "Logic and Related Topics" during November 1981.

The Department actively promotes academic exchanges with other institutions of higher learning internationally and in the Southeast Asian region.

Among the research facilities, the Department has a mathematical research library which contains mathematical books on various fields and mathematical journals of nearly 200 titles.

ANNOUNCEMENT

The International Centre for Pure and Applied Mathematics (ICPAM) has the following programs :

Program 1981

Summer School :	Mathematical modelling and mathematical study in biomedicine	NICE
Autumn School :	Data Bases	NICE

Program 1982

(Preliminary Announcement)

Spring School :	Singular integrals and the harmonic analysis of non smooth domains	NICE
Summer School :	Numerical treatment of elliptic problems with singularities	NICE
Autumn School I :	Elementary algebraic geometry	NICE
Autumn School II :	Introduction to operational research	GRENOBLE

Information and application :

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 FRANCE